Claims

1) A homogeniser (1) for continuous treatment of fluids at very high pressure, of the type comprising:

- at least one single-acting plunger (5) with reciprocating motion from a guide chamber (11) to a compression chamber (6) from a fluid intake position to a fluid delivery position;
- a block (26) for each plunger, connecting the compression chamber (6) with at least one intake valve (28) and with at least one delivery valve (29) for each plunger, housed in containers (30) fixed to the bock (26);
- an internal manifold (27) connecting the compression chamber (6) with the intake valves (28) and delivery valves (29);
- at least one intake pipe (31) and at least one delivery pipe (32) both communicating with the manifold (27) and respectively terminating in the intake valve (28) and in the delivery valve (29),

characterised in that it comprises at least one of the following units:

- a first, dynamic seal unit (21) positioned around the guide chamber (11) and in contact with the surface of the reciprocating plunger (5), designed to create a seal on the plunger (5) during compression;
- a second, static seal unit (24) located close to

the intersection between the compression chamber (6) and the guide chamber (11), being designed to contain the pressure generated in the pump during compression between the opposite surfaces of a block (7) and a housing flange (9) for a dynamic seal (21);

- a third, static seal unit (35) located upstream and downstream of each valve (28, 29) and at the intersection between the manifold (27) and the compression chamber (6), respectively housed in hollows (33, 34, 38) designed to prevent fluid from escaping.

2) The homogeniser according to claim 1, characterised in that the first, dynamic seal unit (21) comprises:
- at least one first self-energising seal (22) with an energising ring made of an elastomer;
- at least one bearing assembly (23), coaxial with and alongside the first self-energising seal (22) and equipped with a system for extraction from its housing such as a suitably sized thread.

3) The homogeniser according to claim 2, wherein the first self-energising seal (22) has a single sealing lip and is made with a combination of plastic materials, high molecular weight PE and PEEK.

4) The homogeniser according to claim 2, wherein the bearing assembly (23) is made of special non-galling stainless steel, such as Nitronic 60.

5) The homogeniser according to claim 1, wherein the second seal unit (24) has a second self-energising static seal (25) with dimensions and geometry which allow the containment of very high pressures, and if necessary fitted with an external anti-extrusion ring (39).

6) The homogeniser according to claim 1, wherein the third seal unit comprises:

- at least one anti-extrusion ring (36) with a rectangular cross-section and a circular ring cross-section in the direction orthogonal to the axis of symmetry;
- at least a third self-energising seal (37) inside the respective anti-extrusion ring (36).

7) The homogeniser according to claim 6, wherein each anti-extrusion ring (36) is mounted in such a way as to create an interference fit with the height of the hollow (33, 34, 38) for a more effective mechanical seal.

8) The homogeniser according to claim 7, wherein the interference fit of each anti-extrusion ring (36) is equal to 0.1 mm on the height of the hollow (33, 34, 38) in which the ring is housed.

9) The homogeniser according to claim 1, wherein the internal surfaces of the manifold (27), the intake pipe (31) and the delivery pipe (32), exposed to the pressure of the fluid, are treated by manual

polishing, radiusing of any edges at the intersections of concurrent holes, micro shot peening and electropolishing.

10) The homogeniser according to claim 1, wherein the plunger (5) is made of a ceramic material such as pure silicon nitride Si_3N_4.

11) The homogeniser according to claim 1, wherein a plunger seal apparatus is present, housed in the guide chamber (11) and locked by a locking flange (10) outside the compression chamber contained in the block (7).

12) The homogeniser according to claim 1, wherein a lubricating - coolant fluid feed channel (17) is positioned on a locking flange (10) immediately axially close to a first, dynamic seal unit (21).

13) The homogeniser according to claim 1, wherein the plunger comprises a guide consisting of a bushing (15) housed in a locking flange (10) and centred relative to a housing flange (9) by a concentric centring projection (13).

14) The homogeniser according to claim 13, wherein the housing flange (9) is centred relative to the block (7) by cylindrical pins (12).

15) The homogeniser according to claim 1, wherein a delivery manifold (40) connects the delivery valve units (29).

16) The homogeniser according to claim 1, wherein a

support flange (41) for the intake valve (28) unit for each plunger is connected to the low pressure intake manifold of the pump.

17) The homogeniser according to claim 1, wherein each static seal unit (35) consisting of a self-energising seal (37) and an anti-extrusion ring (36) can be applied to all of the high pressure seal zones including the connection between the delivery manifold and a homogenising valve.

18) The homogeniser according to any of the foregoing claims, characterised in that it is equipped with an adjustable homogenising valve installed at the outlet of a delivery manifold (40).